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PHYSICAL CHARACTERISTICS OF STREAM SUBBASINS IN THE LONG PRAIRIE RIVER BASIN, CENTRAL MINNESOTA

By C.A. Sanocki and B.C. Fischer
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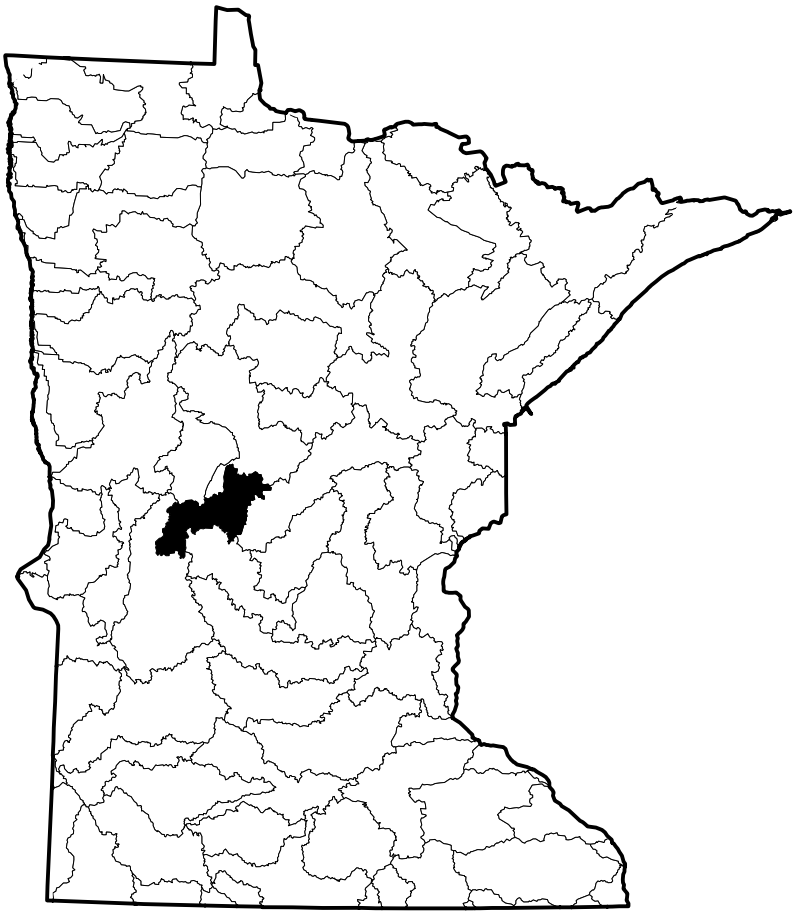

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SANOCKI AND FISCHER PHYSICAL CHARACTERISTICS OF STREAM SUBBASINS IN THE LONG PRAIRE RIVER BASIN CENTRAL MINNESOTA OFR 00-232

Physical Characteristics of Stream Subbasins in the Long Prairie River Basin, Central Minnesota

By Christopher A. Sanocki and Brian C. Fischer

Abstract

Data that describe the physical characteristics of stream subbasins upstream from selected sites on streams in the Long Prairie River Basin, located in central Minnesota, are presented in this report. The physical characteristics are the drainage area of the subbasin, the percentage area of the subbasin covered only by lakes, the percentage area of the subbasin covered by both lakes and wetlands, the main-channel length, and the main-channel slope. Stream sites include outlets of subbasins of at least 5 square miles, and locations of U.S. Geological Survey high-flow, and continuous-record gaging stations.

Introduction

This report is part of a series detailing subbasin characteristics of streams in Minnesota and adjacent states. The Long Prairie River drains an area of 892 square miles and is represented by hydrologic accounting unit 07010108 (U.S. Geological Survey, 1974). The Long Prairie River Basin includes parts of the Otter Tail, Douglas, Todd, Morrison, and Wadena Counties in central Minnesota.

Selected data for sites on streams at outlets of subbasins larger than about 5 square miles; at locations of U.S. Geological Survey (USGS) high-flow, and continuous-record gaging stations located in the Long Prairie River Basin are presented in this report. This report was prepared in cooperation with the Minnesota Department of Transportation.

Acknowledgments

Scott Bryant a graduate student of St. Cloud State University, did much of the digitizing and assisted in the preparation of this report. These contributions were essential for the completion of this report.

Methods

USGS 7-1/2 minute series topographic maps were used as source maps to define subbasin boundaries and to obtain main-channel length, and contour elevation points used in this report. Paper copies of the maps were used. Lake and marsh data were obtained from U.S. Fish and Wildlife Service National Wetlands Inventory Data (U.S. Fish & Wildlife Service, 1981-present). A geographic information system (GIS) was used to define the geographic location and extent of the subbasins, lakes, marshes, main-channels, and elevation points. Data digitized from paper copies were in error by no more than twice the horizontal accuracy of National Mapping Standards of 40 feet (Thompson, 1987, p. 104). All thematic (digitized) data were projected into an Albers Equal-Area projection for storage and analysis.

Subbasin boundaries were delineated on the basis of anthropogenic activities and topographic contours. Anthropogenic activities, such as the installation of storm sewers, the drainage of wetlands, and the diversion of streams, may alter the drainage area of a stream; therefore data from field inspections and recent drainage-ditch maps, were transferred to the topographic maps. The subbasin boundaries were digitized by the Minnesota Department of Natural Resources (DNR), and the USGS Minnesota District using a GIS.

Lake and marsh boundaries were overlaid on the subbasin boundaries to associate each lake and marsh with a subbasin. The total area of lakes and marshes within each subbasin was calculated by the GIS. Total marsh area plus total lake area is defined as storage area.

Main channels were delineated for each subbasin on the 7-1/2 minute topographic maps starting at the outflow of the subbasin and continuing upstream. Whenever the main channel joined with another stream, the stream upstream of the junction that drained the largest area was selected as the main channel. The main channel, which represents the watercourse that drains the greatest area, is continuous and is defined as a single trace that passes through marshes, lakes, and midline of rivers and braided streams from the basin outlet to an endpoint in the basin,

generally at the basin divide. The main channels were digitized by the Minnesota Department of Transportation, using a computer aided drafting system and transferred to the GIS. Stream extensions that represent a portion of the main channel from the end of the mapped stream (blue line on 7-1/2 minute topographic maps) to an endpoint within the basin, generally at the basin divide, were digitized by USGS Minnesota District using a GIS. The main-channel data were overlaid onto the subbasin data to associate each main channel with its subbasin.

Elevation points were digitized at the intersection of topographic contour lines and main channel. The elevation data were digitized using a GIS. The elevation data was overlaid onto the main channel data to associate each elevation data point with a main channel. Two points on the main-channel, at 10 percent and at 85 percent of the main channel length from the basin outlet to the drainage divide, were located by the GIS. The elevations of these two points were interpolated from the digitized elevation data. Main-channel slope was calculated by dividing the difference in elevation between these points by the distance along the stream channel between these points.

Physical Characteristics of Long Prairie River Subbasins

Physical characteristics determined for each of the subbasins shown on plate 1 are presented in table 1. Subbasins are presented in order from headwaters to mouth. The rank of the subbasin stream is shown by indentation; whenever two subbasin streams joined, the stream draining the least cumulative area was assigned a lower rank and indented in the table.

The data for drainage area, and main-channel length are reported using three significant figures or rounded to the nearest one-hundredth of a unit. The data for lake area and storage area are reported to the nearest one-tenth of a percent. The data for main-channel slope is reported to the nearest one-tenth of a foot per mile.

The following is an explanation of the terms used in table 1 and plate 1:

Subbasin number. A seven digit number based on the Minnesota Common Stream and Watershed Numbering System (Minnesota Department of Natural Resources, 1981). The first two digits are “14” and identify the Long Prairie River Basin. The following three digits are arbitrary and were assigned by the DNR. The last two digits were added by the USGS Minnesota District, to identify additional subdivisions to the DNR’s watersheds at locations of USGS gaging stations and to identify noncontributing areas.

Stream name. The name of the stream or ditch shown on 7-1/2 minute topographic maps. The relative position of the subbasin above other subbasins, streams, and gaging stations.

Outlet location. The U.S. Public Lands Survey System is used to describe the location where the stream exits the subbasin, down to quarter-quarter section. The description includes quarter-quarter section, section, township, and range.

Drainage area. That area, measured on a horizontal plane, enclosed by a topographic divide, within which direct surface runoff from precipitation normally flows by gravity into a watercourse above a specific point. This may include closed basins and other areas that do not contribute directly to surface runoff.

Lake area. The percentage of the drainage area labeled lacustrine (lakes) on U.S. Fish and Wildlife Service National Wetlands Inventory Data.

Storage area. The percentage of a drainage area labeled lacustrine (lakes) and palustrine (wetlands) on U.S. Fish and Wildlife Service National Wetlands Inventory Data. Marsh areas shown on plate 1 are from USGS 1:100,000 digital line graph data 1993.

Main-channel length. The total length of the main channel from the basin outlet to a point within the basin (generally at the basin divide) representing the watercourse that drains the greatest area.

Main-channel slope. The average slope of the watercourse between the points at 10 and at 85 percent of the distance along the main channel from the basin outlet to the drainage divide.

Stream extension. A representation of the main channel from the end of the mapped stream line (blue line on 7-1/2 minute topographic maps) to an endpoint within the basin, generally at the basin divide. This is done by interpreting topographic relief so that the extension of the main channel represents the watercourse draining the greatest area.

References Cited

Minnesota Department of Natural Resources, 1981, The common stream and watershed numbering system: Minnesota Department of Natural Resources Stream Inventory and Data Retrieval Systems Report 7002, unpaged.

Thompson, M.M., 1987, Maps for America, 3d edition: U.S. Geological Survey, 265 p.

U.S. Geological Survey, 1974, Hydrologic unit map—1974 State of Minnesota: 1 plate, scale 1:500,000.

U.S. Fish & Wildlife Service, National Wetlands Inventory Digital Data: Oct. 1981 to present.

Table 1.—Physical characteristic data for the Long Prairie River Basins

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
1400309	Noncontributing area to basin 1400300	--	--	--	--	7.48	8.6	17.0	7.48	8.6	17.0	--	--
1400100	Unnamed tributary to Fish Lake	NE NW	26	131N	38W	7.69	0.9	15.8	15.2	4.7	16.3	6.10	21.7
1400300	Unnamed tributary to Lake Miltona	NW SW	24	130N	38W	18.4	5.2	19.5	33.5	5.0	18.1	17.6	9.3
1400700	Unnamed tributary to Lake Miltona	NE SW	27	130N	37W	11.8	9.4	26.4	11.8	9.4	26.4	9.60	8.4
1400209	Noncontributing area to basin 1400200	--	--	--	--	0.07	0.0	14.3	0.07	0.0	14.3	--	--
1400200	Unnamed tributary to Lake Miltona	NW SE	21	130N	37W	6.91	7.9	21.1	6.98	7.8	21.0	5.10	20.2
1400800	Unnamed tributary to Lake Ida	NW NW	1	129N	38W	18.9	48.1	52.5	71.1	17.4	28.9	19.5	8.1
1400900	Lake Ida outlet	NE SE	26	129N	38W	29.9	23.8	31.8	101.	19.3	29.7	25.2	5.4
1402400	Unnamed tributary to Grill Lake	SE SE	36	128N	39W	31.3	17.1	32.2	31.3	17.1	32.2	10.8	2.3
1402300	Unnamed tributary to Lobster Lake	NW SW	25	128N	39W	11.0	22.2	32.4	42.3	18.4	32.2	12.4	1.5
1402200	Unnamed tributary to Lake Mina	SW NW	20	128N	38W	11.0	27.5	36.9	53.3	20.3	33.2	19.8	0.7
1402100	Lake Brophy outlet	NW SE	10	128N	38W	10.4	13.2	27.4	63.7	19.1	32.2	19.8	0.7
1402000	Unnamed tributary to Lake Darling	SE SE	11	128N	38W	12.0	21.5	29.7	176.	19.4	30.6	32.3	4.2
1402600	Unnamed tributary to Lake Jessie	SE NE	34	128N	37W	12.3	1.3	25.4	12.3	1.3	25.4	8.04	6.8
1402500	Unnamed tributary to Lake Geneva	NE NE	21	128N	37W	13.3	9.6	18.7	25.5	5.6	21.9	11.1	5.0
1401900	Lake Le Homme Dieu outlet	SE NE	32	129N	37W	26.6	18.1	24.8	52.1	12.0	23.4	16.4	2.9
1401000	Lake Carlos outlet	NE SE	16	129N	37W	17.5	34.4	40.9	247.	18.9	29.8	40.1	3.2
1401100	Long Prairie River above unnamed tributary (basin 1401200)	NW SW	6	129N	36W	12.8	0.0	12.1	259.	18.0	29.0	47.1	2.9
1401200	Unnamed tributary to Long Prairie River	NE SW	6	129N	36W	5.29	0.0	32.4	5.29	0.0	32.4	5.25	13.3
1401702	Long Prairie River above Spruce Creek	NE NE	10	129N	36W	8.37	0.8	9.4	273.	17.1	28.4	51.6	2.8

Table 1.—Physical characteristic data for the Long Prairie River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
1400400	County Ditch 24 above unnamed tributary (basin 1400502)	SW NE	31	131N	36W	7.44	0.0	34.8	7.44	0.0	34.8	5.48	13.8
1400502	Unnamed Tributary to Spruce Creek	SW NE	31	131N	36W	3.54	0.0	49.9	3.54	0.0	49.9	2.93	7.9
1400501	Spruce Creek above unnamed tributary (basin 1401300)	NE SE	33	130N	36W	21.1	1.1	21.1	32.1	0.7	27.5	17.8	6.1
1401300	Unnamed Tributary to Spruce Creek	SW SE	33	130N	36W	6.50	0.6	24.1	6.50	0.6	24.1	6.94	13.6
1400500	Spruce Creek to Long Prairie River	NW NE	10	129N	36W	0.77	0.0	34.4	39.3	0.7	27.0	19.8	6.0
1401701	Long Prairie River above Stormy Creek	NW SW	11	129N	36W	0.41	0.0	40.7	313.	15.0	28.3	52.6	2.8
1400600	Stormy Creek to Long Prairie River	SW NW	11	129N	36W	13.3	0.0	15.5	13.3	0.0	15.5	11.2	15.4
1401400	Unnamed tributary to Long Prairie River	SW NW	11	129N	36W	7.52	0.0	9.8	7.52	0.0	9.8	7.10	15.1
1401700	Long Prairie River above Calamus Creek	SE SE	15	129N	36W	2.32	0.0	25.4	336.	14.0	27.3	54.1	2.8
1401800	Calamus Creek to Long Prairie River	SE SE	15	129N	36W	8.67	0.0	19.2	8.67	0.0	19.2	5.92	2.8
1401600	Long Prairie River above Dismal Creek	SE SW	17	129N	35W	7.98	0.0	14.9	352.	13.3	26.8	59.2	2.6
1404000	Dismal Creek to Long Prairie River	SE SW	17	129N	35W	16.7	0.5	22.5	16.7	0.5	22.5	11.1	8.3
1404201	Long Prairie River above County Ditch 22	NE NE	6	129N	34W	17.2	0.0	17.1	386.	12.2	26.2	71.5	1.9
1404100	County Ditch 22 to Long Prairie River	NW NW	5	129N	34W	6.88	0.0	14.6	6.88	0.0	14.6	7.09	13.2
1404200	Long Prairie River above Freemans Creek	NE SE	5	129N	34W	4.62	0.0	17.9	398.	11.8	25.9	73.8	1.8
1404800	Freemans Creek to Long Prairie River	NE SE	5	129N	34W	10.0	0.0	31.1	10.0	0.0	31.1	9.46	8.9
1405901	Long Prairie River above unnamed tributary (basin 1405800)	SE NE	9	129N	34W	3.90	0.0	23.8	412.	11.4	26.0	76.4	1.7
1405800	Unnamed tributary to Long Prairie River	NE SE	9	129N	34W	7.49	5.0	16.2	7.49	5.0	16.2	6.08	13.1
1405900	Long Prairie River above Venewitz Creek	NE NW	20	129N	33W	11.8	0.0	17.8	431.	11.0	25.6	85.5	1.5

Table 1.—Physical characteristic data for the Long Prairie River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
1405709	Noncontributing area to basin 1405700	--	--	--	--	2.37	0.0	4.2	2.37	0.0	4.2	--	--
1405700	Venewitz Creek to Long Prairie River	NE NW	20	129N	33W	16.4	3.7	16.7	18.8	3.3	15.1	7.45	6.0
1405102	Long Prairie River above gaging station at Long Prairie: station number is 05245100	SW SE	20	129N	33W	0.04	0.0	1.8	450.	10.7	25.6	85.6	1.5
1405101	Long Prairie River above basin 1405100	SW SE	17	129N	33W	1.16	0.0	9.8	451.	10.6	25.6	85.9	1.5
1405000	Drayer Creek to Long Prairie River	NE NE	8	130N	33W	8.19	0.0	13.2	8.19	0.0	13.2	7.42	15.2
1405100	Long Prairie River above Drayer Creek	NE NE	8	130N	33W	17.5	0.2	16.9	477.	10.1	24.7	101.	1.2
1404500	Unnamed tributary to Eagle Creek	SE SE	34	131N	35W	11.6	0.0	18.6	11.6	0.0	18.6	6.91	14.6
1401500	Eagle Creek above unnamed tributary (basin 1404500)	NE NE	3	130N	35W	10.7	0.0	14.9	10.7	0.0	14.9	8.21	12.2
1404400	Eagle Creek above County Ditch 31	NW NE	20	131N	34W	11.6	0.0	10.4	33.9	0.0	14.6	17.1	7.1
1404300	County Ditch 31 to Eagle Creek	NE NE	20	131N	34W	5.46	0.0	17.3	5.46	0.0	17.3	4.37	14.0
1404600	Eagle Creek above unnamed tributary (basin 1406200)	NW SE	26	131N	34W	14.2	0.0	17.4	53.6	0.0	15.6	22.6	6.6
1406200	Unnamed tributary to Eagle Creek	NW SE	26	131N	34W	5.38	0.0	18.3	5.38	0.0	18.3	5.14	10.0
1406100	Unnamed tributary to Eagle Creek	SW NW	5	130N	33W	7.68	0.0	18.5	7.68	0.0	18.5	8.45	8.5
1404701	Eagle Creek above Harris Creek	NW NE	8	130N	33W	8.02	0.0	20.6	74.7	0.0	16.7	30.5	6.3
1404900	Harris Creek to Eagle Creek	NW NE	8	130N	33W	18.8	0.0	25.6	18.9	0.0	25.6	13.6	8.1
1404700	Eagle Creek to Long Prairie River	NE NE	8	130N	33W	0.02	0.0	85.0	93.5	0.0	18.4	31.1	6.2
1406002	Long Prairie River above unnamed tributary (basin 1406001)	SE NE	28	131N	33W	3.50	0.0	13.4	573.	8.4	23.6	105.	1.2

Table 1.—Physical characteristic data for the Long Prairie River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
1406001	Unnamed tributary to Long Prairie River	SE NE	28	131N	33W	4.69	0.0	8.4	4.69	0.0	8.4	5.10	16.4
1403900	Unnamed tributary to Long Prairie River	NE SE	11	131N	33W	8.87	0.9	22.8	8.87	0.9	22.8	9.57	4.3
1406000	Long Prairie River above unnamed tributary (basin 1403900)	SE NE	11	131N	33W	10.0	1.8	20.0	597.	8.1	23.4	113.	1.2
1403702	Long Prairie River above Turtle Creek	NE SE	2	131N	33W	0.60	0.0	24.3	597.	8.1	23.4	115.	1.2
1405600	Turtle Creek above unnamed tributary (basin 1405500)	SW NE	14	129N	33W	9.34	0.0	21.7	9.34	0.0	21.7	5.18	6.4
1405500	Unnamed tributary to Turtle Creek	SW NE	14	129N	33W	5.36	0.0	22.9	5.36	0.0	22.9	3.39	15.6
1405400	Turtle Creek above unnamed tributary (basin 1405200)	NW NW	26	130N	33W	8.51	1.3	18.9	23.2	0.5	21.0	11.3	3.7
1405201	Unnamed tributary above unnamed tributary (basin 1405300)	NW NW	25	130N	33W	7.12	5.9	34.2	7.12	5.9	34.2	5.38	5.9
1405300	Unnamed tributary above unnamed tributary (basin 1405201)	NW NW	25	130N	33W	6.45	5.6	31.9	6.45	5.6	31.9	4.59	14.0
1405200	Unnamed tributary to Turtle Creek	NW NW	26	130N	33W	0.73	0.0	34.2	14.3	5.5	33.2	6.86	4.6
1403800	Turtle Creek to Long Prairie River	NE SE	2	131N	33W	39.7	6.6	31.6	77.2	4.6	28.7	28.8	2.5
1403701	Long Prairie River above Moran Creek	NE NW	23	132N	33W	11.0	0.7	11.5	686.	7.6	23.8	119.6	1.2
1403200	Unnamed tributary above unnamed tributary (basin 1403101)	NW SE	13	133N	34W	8.23	0.0	32.7	8.23	0.0	32.7	6.97	6.7
1403101	Unnamed tributary to Moran Creek	NW SE	13	133N	34W	4.66	0.0	30.2	4.66	0.0	30.2	5.69	7.0
1403100	Moran Creek above County Ditch 25	SW NE	9	132N	33W	23.9	1.6	28.3	36.8	1.0	29.5	20.6	4.6
1403500	County Ditch 25 to Moran Creek	NE SW	9	132N	33W	29.3	0.0	27.3	29.3	0.0	27.3	13.3	9.1
1403600	Moran Creek to Long Prairie	NE NW	23	132N	33W	5.34	0.0	14.8	71.4	0.5	27.5	25.5	4.1

Table 1.—Physical characteristic data for the Long Prairie River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
1403700	Long Prairie River above Stony Brook	SW NE	12	132N	33W	1.96	0.0	1.9	759.	6.9	24.1	122.	1.2
1403300	Stony Brook to Long Prairie River	SE NW	12	132N	33W	15.0	0.0	35.2	15.0	0.0	35.2	8.09	5.4
1403400	Long Prairie River above Fish Trap Creek	NW NW	4	132N	32W	11.7	1.9	28.3	786.	6.7	24.4	125.	1.2
1406309	Noncontributing area to basin 1406300	--	--	--	--	4.49	0.0	1.2	4.49	0.0	1.2	--	--
1406300	Throughfare to Fish Trap Lake	NW NW	33	132N	31W	25.2	17.5	27.3	29.6	14.8	23.4	12.2	4.6
1403000	Fish Trap Creek above unnamed tributary (basin 1402900)	SE NW	24	132N	32W	11.0	18.5	38.8	40.7	15.8	27.5	17.4	1.4
1402900	Unnamed tributary to Fish Trap Creek	SE NW	24	132N	32W	18.7	14.7	23.9	18.7	14.7	23.9	11.2	0.5
1402800	Fish Trap Creek to Long Prairie River	NW NW	4.0	132N	32W	23.2	2.5	30.3	82.6	11.8	27.5	24.3	1.8
1402701	Long Prairie River above basin 1402700	SW NW	19	133N	31W	10.4	0.0	15.2	879.	7.1	24.5	136.	1.3
1402700	Long Prairie River	NE NW	20	133N	31W	13.3	0.4	29.5	892.	7.0	24.6	136.	1.3